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A New *Ernodes* (Trichoptera, Beraeidae) from Japan

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Abstract A new species of the genus *Ernodes* belonging to the family Beraeidae is described from Japan and illustrated. This is the first record of the genus from eastern Asia. The larvae are found in streams, and pupation occurs on the underside of stones. Adults emerges in the daytime.

Key words: Trichoptera, Beraeidae, new species, *Ernodes gracilis*, Japan.

The Beraeidae are a small family sparsely distributed over the Holarctic Region (WIGGINS, 1977). Five genera of the family have been known from Europe (including northwestern Africa and Caucasus), Iran and eastern North America (BĂNĂRESCU, 1990). However, their members had not been known from eastern Asia before our study of the trichopteran fauna was made in the Tama-River system (KAGAYA *et al.*, in press).

In 1989, two beraeid males were found in Hinohara-mura, Tokyo, by the senior author; Dr. G. B. WIGGINS and Mr. W. K. GALL, Royal Ontario Museum, Canada, kindly suggested that these specimens probably belonged to a species of *Ernodes*. In 1991, we collected three pupae with many adults from a stream in Hachiôji City, Tokyo, and succeeded in collecting the larvae at the same locality in 1992. Though this is related to other *Ernodes* species, the specimens are distinctly different from the known species of the genus from the western Palearctic Region (see below). In this paper, we will describe the first species of *Ernodes* from Japan and give some ecological information. It is hoped that the knowledge of the Beraeidae will increase in eastern Asia.

Materials and Methods

Male and female genitalia and some larval characters were figured after treatment in hot 10% KOH. Immature stages were associated with the adult by the metamorphotype method and rearing. SEM micrographs of larva were prepared by JEOL JSM-5400LV after drying in a freeze dryer of Trio Science and gold-coating using JEOL JFC-1100E. Morphological terms used in this study follow SCHMID (1980) for the adult and WIGGINS (1977) for the larva.

Specimens used in this study are deposited in the collection of the Natural History Museum and Institute, Chiba (CBM); Royal Ontario Museum, Toronto, Canada (ROM), and the personal collections of Mr. M. UENISHI (MU), Entomological Laboratory, College of Agriculture, University of Osaka Prefecture, and the authors (TN, TK).

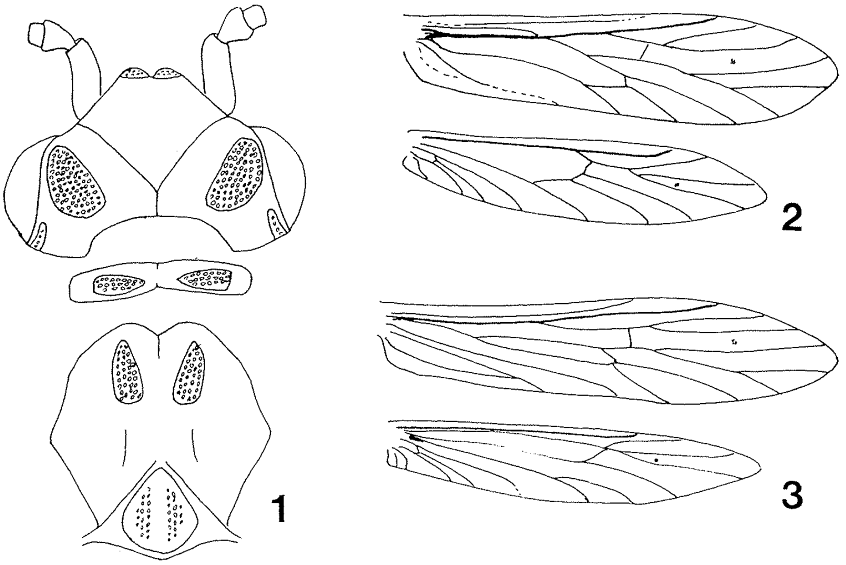
Ernodes gracilis sp. n.

[Japanese name: Tsuno-tsutsu-tobikera]

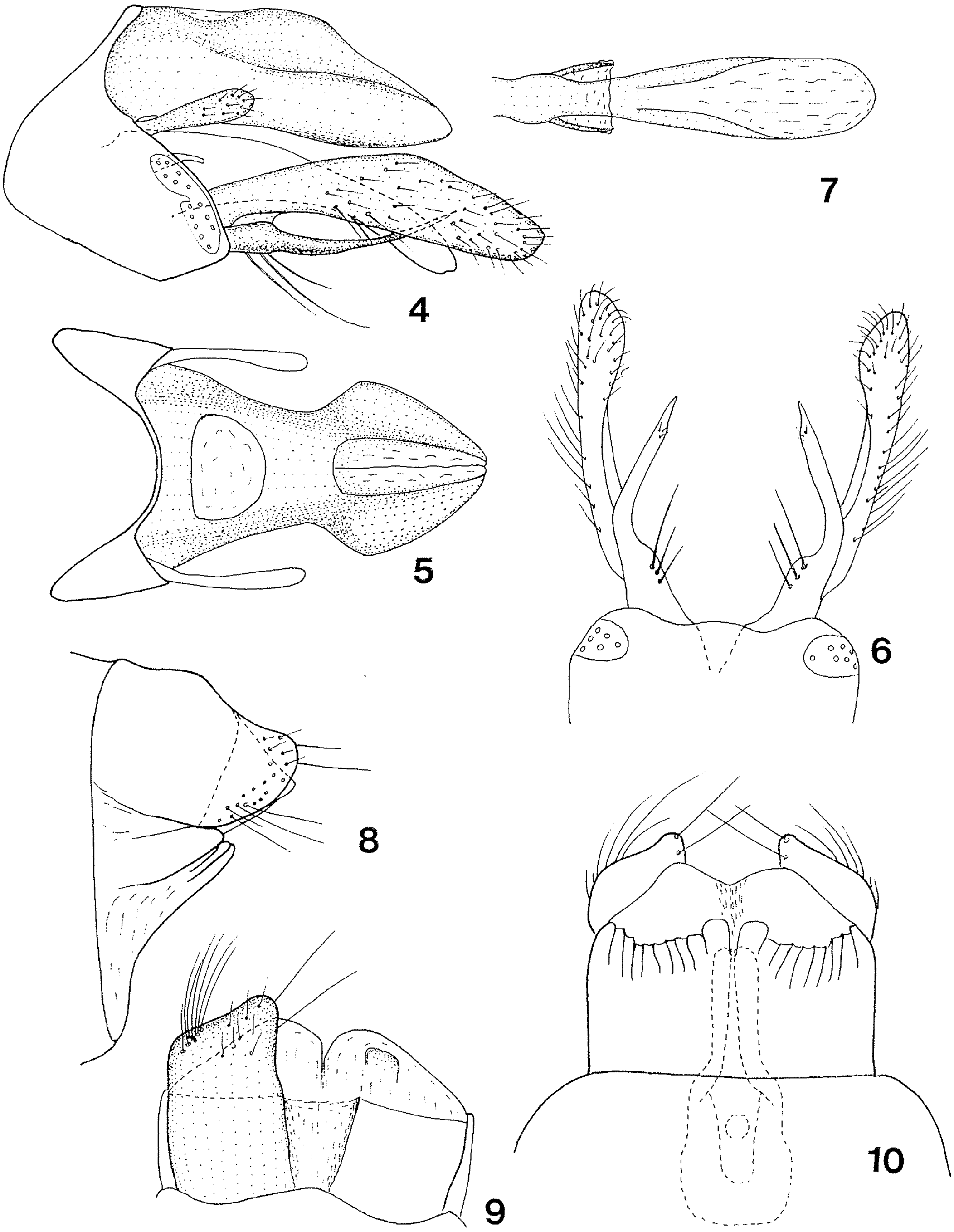
(Figs. 1–24)

Adult (Figs. 1–3). Body, wings and antennae blackish brown. Ocelli absent. Antenna ca. 3.0 mm long. Maxillary palpi 5-segmented, 0.62 mm long, relative length of 5 segments ca. 2.5: 3: 5: 4: 6. Legs with tibial spurs 2, 2, 4. The 7th sternite with a ventral process. Fore wing 3.5–4.5 mm long, basal callosity absent, apical forks IV and V present, apical fork I sometimes present. Hind wing 3.0–3.8 mm long; apical fork V present. Media of both wings of male reduced on basal half.

Male genitalia (Figs. 4–7): Ninth segment broad laterally. The dorsal part narrow. Tenth segment long. The basal half sclerotized with a large semi-membranous half circle at the center in dorsal aspect. The apical half divided vertically

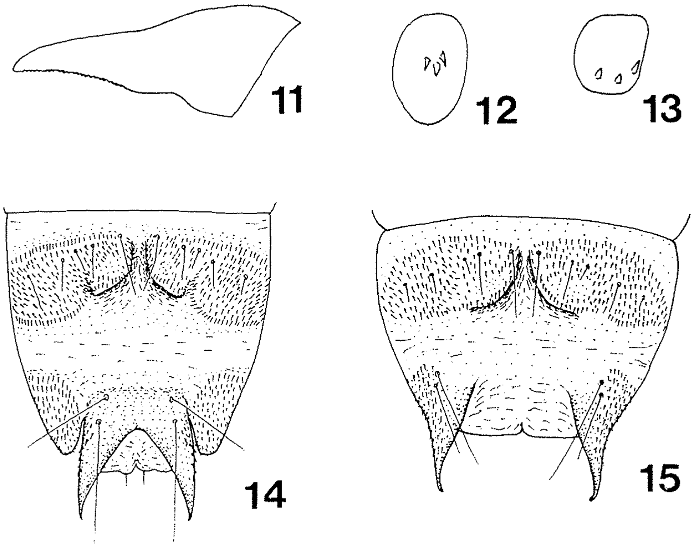


Figs. 1–3. Adult of *Ernodes gracilis* sp. n. —— 1, Dorsal view of head, pro- and mesonota and wings; 2, wings of male; 3, wings of female.



Figs. 4–10. Male and female genitalia of *Ernodes gracilis* sp. n. —— 4–7, Male: 4, lateral; 5, dorsal; 6, ventral; 7, phallus, dorsal. —— 8–10, Female: 8, lateral; 9, dorsal; 10, ventral.

in dorsal aspect, inner semi-membranous parts in contact with each other. Tenth segment with club-like preanal appendages, shorter than a half of the segment, without intermediate appendages. Inferior appendages composed of lateral and ven-



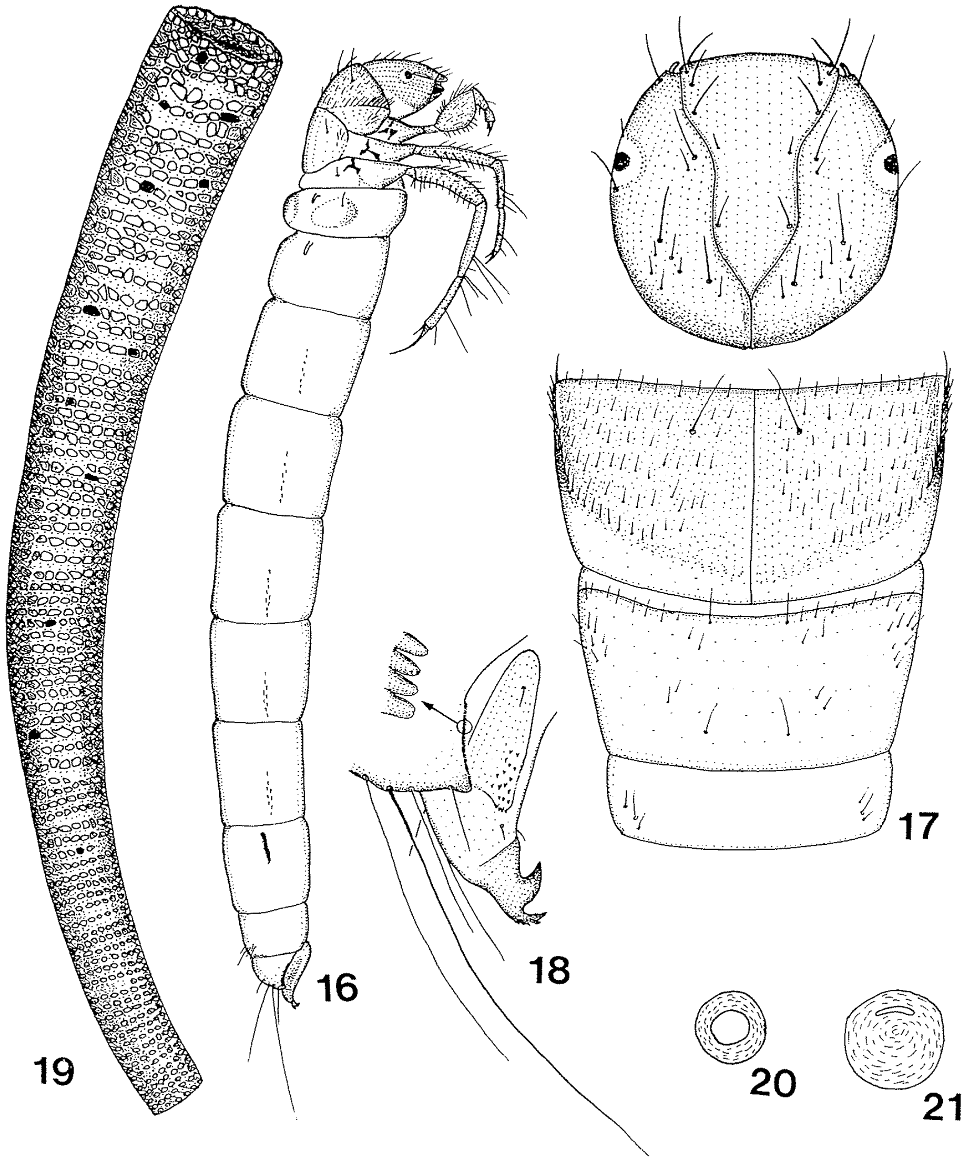
Figs. 11–15. Pupa of *Ernodes gracilis* sp. n. —— 11, Right mandible; 12, hook-palte on the anterior dorsum of 5th segment; 13, same on posterior dorsum of 5th segment; 14, 9th and 10th segments of male, dorsal; 15, same, female.

tral lobes; lateral lobes, broad in apical half in lateral aspect, round at apex; ventral lobes, slender and heavily sclerotized, slightly curved upward, pointed at apex, with 3 long stout setae near the base. Phallus sclerotized but membranous on the dorsum of apical half, short parameres present at the base; transparent membrane covering the parameres dorsally.

Female genitalia (Figs. 8–10). Ninth tergite sclerotized, separated by semi-membranous part in dorsal aspect. Appendages of 10th segment sclerotized. Tenth segment notched in the middle of apical margin, semi-membranous, with a pair of sclerotized swellings on the dorsum. Ninth sternite sclerotized weakly, vertical ridges at the posterior margin.

Pupa (Figs. 11–15). Body ca. 5 mm long. Mandible with many minute teeth in apical half of inner blade. Middle tarsi bearing a fringe of hairs. Gills and lateral fringe of abdominal segments absent. Dorsal hook-plates present on anterior margins of 3rd to 6th segments, on posterior margin of 5th segment. Ninth and 10th segments darkly pigmented with numerous minute spines. Ninth segment with a pair of humps dorsally. A pair of anal processes acute at apices.

Final instar larva (Figs. 16–18, 22–24): Body 4–5 mm long. Head ca. 0.65 mm wide, reddish brown, circular in dorsal aspect, with a ridge from eye to anterior margin in lateral aspect. Antenna situated near the end of anterior margin. Pronotum sclerotized, reddish brown, paler at posterior part; a carina extending obliquely across pronotum but not conspicuous, with spine-like setae. Mesonotum slightly sclerotized, unpigmented, mid-dorsal ecdysial line absent. Metanotum not sclerotized, unpigmented. Single tracheal gills usually present dorsolaterally on anterior part of 1st abdominal segment and often on 2nd abdominal segment.



Figs. 16–21. Larva and case of *Ernodes gracilis* sp. n. —— 16–18, Final instar larva: 16, lateral; 17, head, pro-, meso- and metanota, dorsal; 18, anal proleg, lateral; 19, Case of final instar larva; 20, silken membrane, posterior end of larval case; 21, same, anterior opening of pupal case.

Lateral fringe of abdomen modified into specialized setae as in *Beraea* (WIGGINS, 1977; HAMILTON, 1985) on 3rd to 7th segments. A comb-like sclerite present on 8th segment laterally, teeth bifurcate. Ninth segment without dorsal sclerite. Lateral sclerite of anal proleg reduced, not extending posteriorly, with many teeth on ventral margin and long setae on posterior margin. Anal claw with an accessory hook.

Case (Figs. 19–21): Cases of final instar larvae 6–8 mm long, constructed by sand grains and silk, conical, curved; posterior end closed by a silken membrane with a central hole. Anterior opening of pupal case closed by a silken membrane with a bent slit at one side.

Holotype. ♂ (pinned specimen), CBM-ZI 33260, Ozu-gawa River, Ozu, Hachiôji-shi, Tokyo, pupa collected on 8. VI. emerged on 11. VI. 1992 by TN (CBM).

Paratypes. Type locality: 9 ♂ 4 ♀ (pinned specimens), same data as the holotype (1 ♂ 2 ♀, CBM-ZI 33261–33263; 2 ♂ 1 ♀, ROM; 3 ♂ 1 ♀, TN; 3 ♂, TK); 17 ♂ 21 ♀ (in alcohol), same locality, collected 8. VI. emerged 8–23. VI. 1992 by TN (4 ♂ 9 ♀, CBM-ZI 33264–33276; 4 ♂ 3 ♀, ROM; 6 ♂ 6 ♀, TN; 3 ♂ 3 ♀, TK).

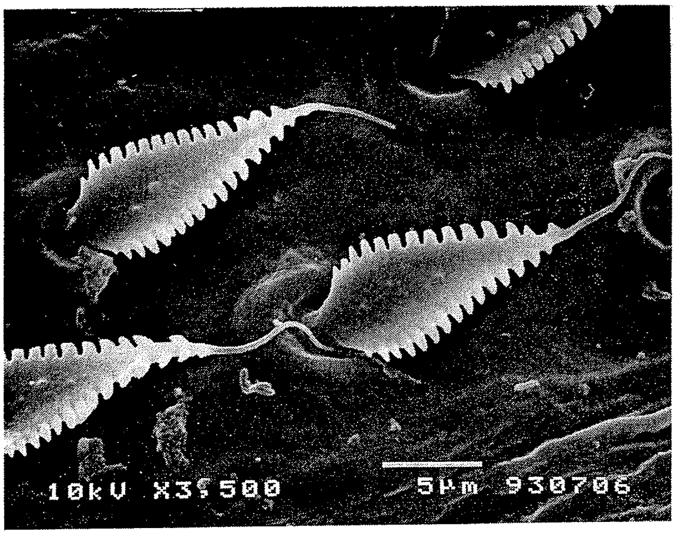
Other specimens examined. Tokyo, 32 ♂ 13 ♀, 3 pupae, type locality, 4. VI. 1991, TN & TK (32 ♂ 13 ♀, TN; 3 pupae, TK); 3 larvae, ibid., 25. III. 1992, TN (TN); 90 larvae, ibid., 9. IV. 1992, TN (TN); 44 larvae, 15 prepupae, 2 pupae, ibid, 13. V. 1992, TN (15 larvae, CBM; 15 larvae, ROM; other specimens, TK); 134 pupae, ibid., 8. VI. 1992, TN (20 pupae, CBM; 20 pupae, ROM, 94 pupae, TN); 19 pupae, ibid., 19. VI. 1992, TN (TN); 2 ♂ 3 ♀, Ongata, Hachiôji-shi, 4. VI. 1991, TN (TN); 2 ♀, Daigo, Hachiôji-shi, 4. VI.1991, TN (TN); 1 ♂, Kitaaki-gawa R., Koiwa, Hinohara-mura, 14. VI. 1989, TN (TN); 1 ♂, Kitaaki-gawa R., Nakazato, Hinohara-mura, 14. VI. 1989, TN (ROM); Chiba, 2 ♀, Ohbiso-gawa R., Amatsu-kominato-machi, 6. VI. 1993, R. B. Kuranishi, (CBM); Osaka, 1 ♂, Minoo R., Minoo, 20. V. 1991, MU (MU); 1 ♂, ibid., 7. VI. 1991, MU (MU).

Biology. All adults used in this study were collected near streams or rivers. At the type locality, larvae live in areas of slow current with sand and cobbles on the bottom. The pupal case is fastened to the under surface of cobbles or boulders in similar area to larval habitat. In the laboratory (June 8–23, 1992), all adults emerged in the daytime. The adults were active during the day, though copulation and oviposition were not observed. Collections for this study suggest that this species has a univoltine life cycle, because we were unable to collect any specimens from middle summer to winter.

Distribution. Japan (Tokyo, Chiba and Osaka).

Remarks. At present, this is the only species of *Ernodes* known from eastern Asia, and differs distinctly from European species in male genitalia, especially the 10th segment. Although information is limited about larvae of *Ernodes*, the final instar larva of this species differs from those of the European species (LEPNEVA, 1966) in the presence of gills and feathery setae on the abdominal segments and in the anal proleg. In particular, the lateral sclerite of the anal proleg does not extend posteriorly in *E. gracilis*, whereas European species are characterized by a long thick seta on its apex. The specific name refers to the slender case of the larva.

Figs. 22–24. SEM micrographs of *Ernodes gracilis* sp. n., larva —— 22, Specialized setae on 7th segment; 23–24, comb-like sclerite on 8th segment.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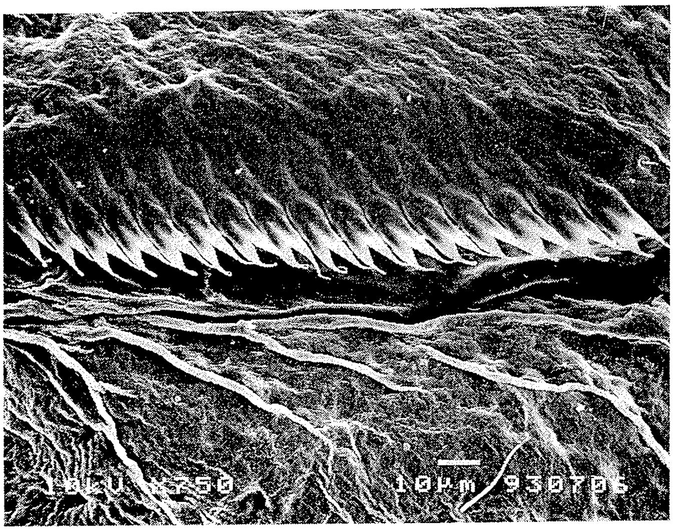
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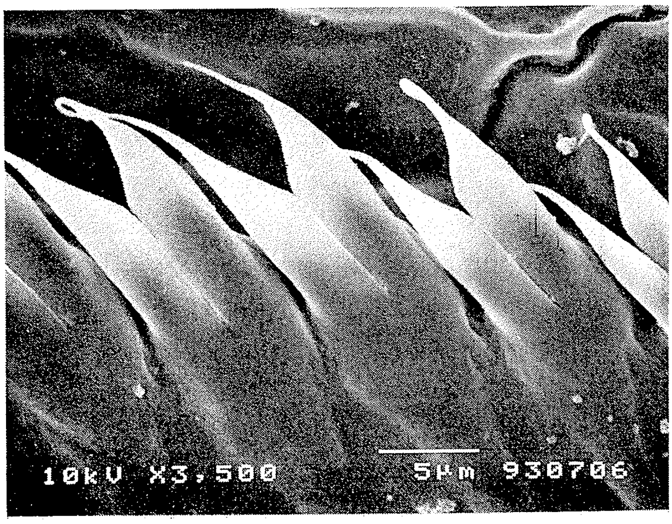
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24

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